Pose Estimation Errors, the Ultimate Diagnosis

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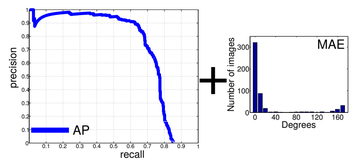
The problem . . .

High Level of Heterogeneity in the Object Detection & Pose Estimation Problem!

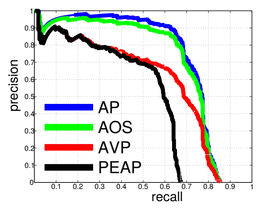
Different Datasets:

Different Evaluation Metrics:

- Pose estimation **&** detection → separated evaluation.



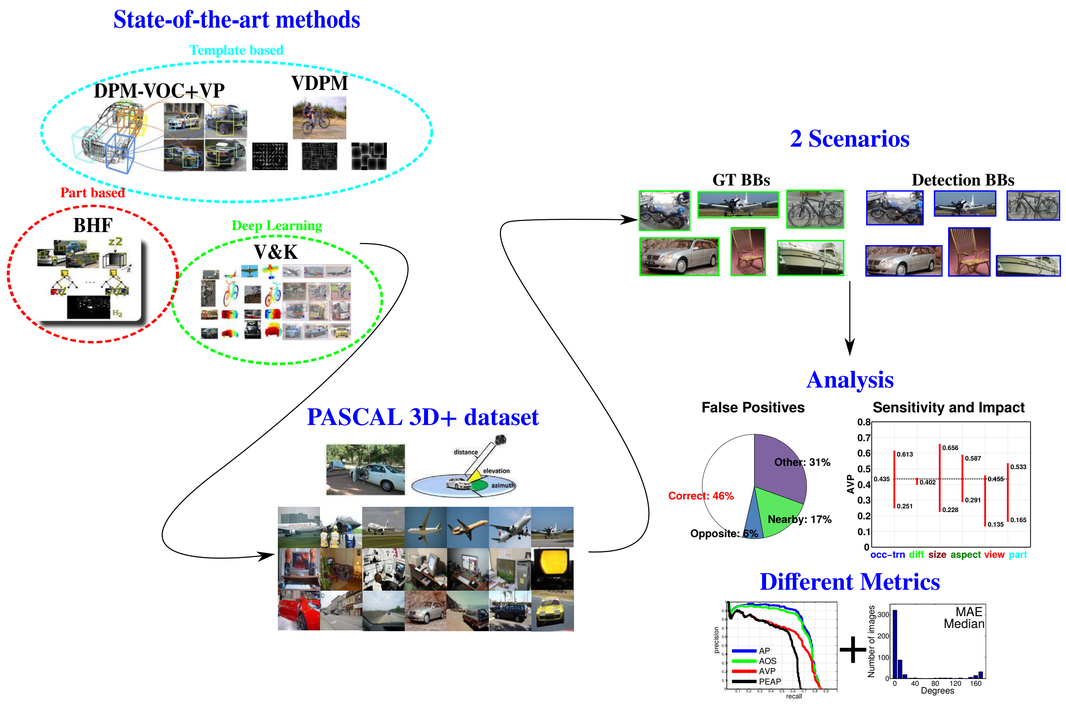
- Only in the last years, 3 different metrics for simultaneous evaluation.



Our proposal

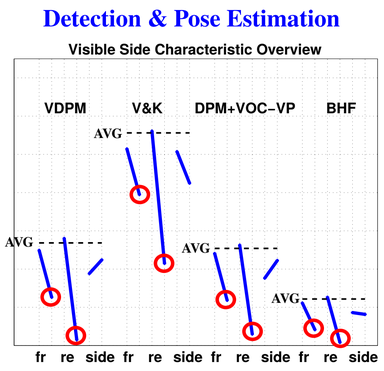
1. To consolidate the work.
2. A publicly available diagnostic tool.
3. For the PASCAL 3D+ dataset:
   - Evaluation of the main false positives.
   - Influence of the object characteristics.
   - Precise evaluation of the metrics.

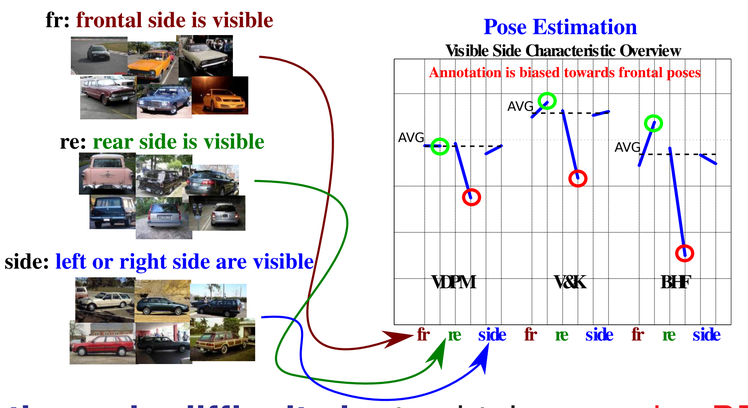
Diagnostic Tool



Our analysis

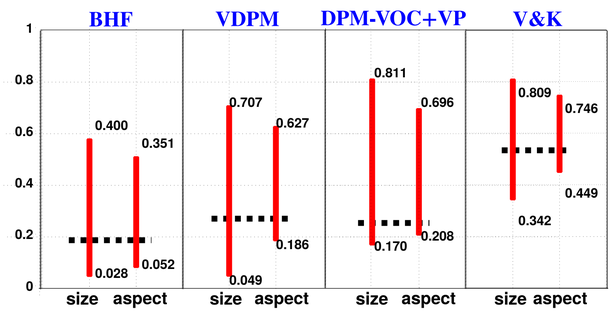
1. **For pose estimation only, models are biased towards the training data distribution.**





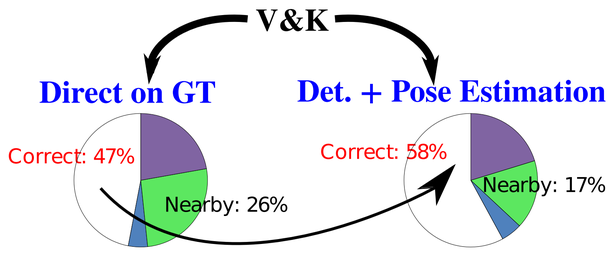
2. **For simultaneous detection and pose estimation, the main difficulty is**: to obtain a precise BB and a correct estimation for the frontal/rear views.

3. **Size and Aspect Ratio matter**: all methods present difficulties working with unusual aspect ratios and sizes of the objects.



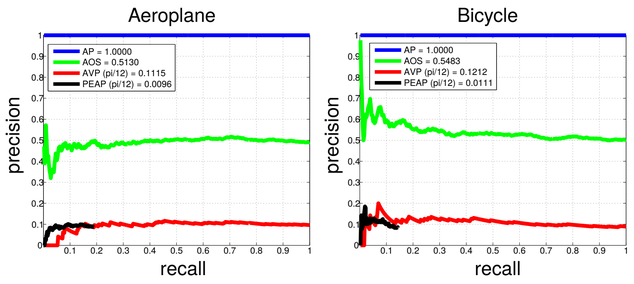
4. **There is a correlation between easy-to-detect objects and easy-to-estimate-pose objects.**

	BHF		VDPM		V&K	
	Det.	GT	Det.	GT	Det.	GT
AP	15.8	100	29.6	100	57.2	100
AVP	5.8	29.7	18.1	42.1	43.5	61.2
Rate	**36.7**	29.7	**61.1**	42.1	**76**	61.2

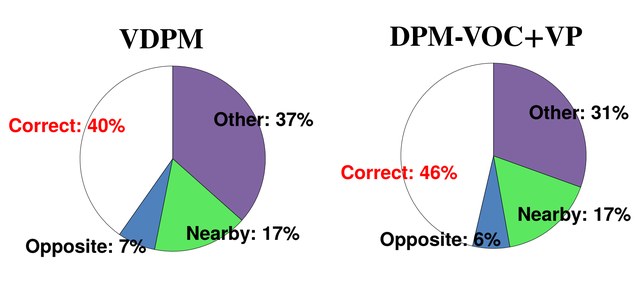


5. **Evaluation metrics.**
   - AOS is greatly dominated by the detection performance.
   - AVP and PEAP are more adequate to simultaneously evaluate the detection and pose estimation performance.

Method	Metrics	AVG (%)
RAND	AP	100
	AOS	**52.2 !!!**
	AVP	10.8
	PEAP	1

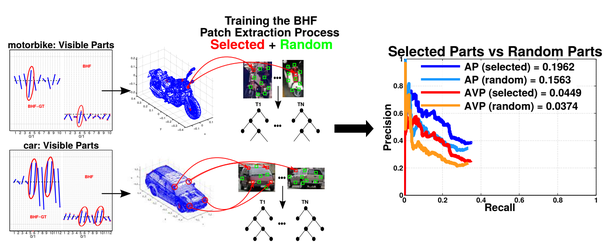


Method	Metrics	AVG (%)
VDPM	AP	29.6
	AOS	**26.8**
	AVP	18.1
	PEAP	10.8
DPM-VOC+VP	AP	27.1
	AOS	**25.4**
	AVP	19
	PEAP	12.7

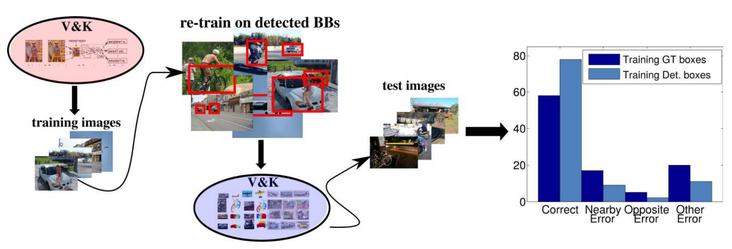


Examples of how by using our diagnostic tool the models can be improved

Part-based Approaches



Models which decouple detection & pose estimation tasks



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